

# Disturbance, ecological

*The Gale Encyclopedia of Science* , September 2, 2009



An ecological disturbance is an event of intense environmental stress causing large changes in the affected ecosystem. Ecological disturbances can result from natural causes or from the activities of humans.

Natural ecological disturbances may be caused by physical stressors such as volcanic eruptions, hurricanes, tornadoes, earthquakes, and over geological time, glacial advance and retreat. Humans also can cause physical disturbances through development of land or coasts, pollution, or long-term impacts on the environment, such as climate change. Forest fires, either natural or human-induced, are another example of ecological disturbance. Biological stresses, such as when a severe infestation of defoliating insects causes substantial mortality of trees in a forest or of agricultural crops, represent a type of ecological disturbance. Other examples include invasive species, parasites, and epidemics.

Ecologic disturbance can occur at a variety of spatial scales. The most extensive disturbances involve landscape-scale events, such as glaciation, which can affect entire continents. Tornadoes, hurricanes, and wildfires can also affect very large areas. Wildfires can spread over and affect millions of acres.

Some disturbances are much more local in their effects. For example, the primary disturbance regime in old-growth forests is associated with the death of individual, large trees caused by disease, insect attack, or a lightning strike. This sort of microdisturbance event results in a gap in the otherwise closed forest canopy. This encourages the growth of plant and animal communities different from those usually found on the dark, moist

forest floor. Further ecological changes occur when the dead tree falls to the ground and slowly rots. Diverse processes of ecological recovery occur in response to the within-stand patch dynamics associated with the deaths of large trees in old-growth forests.

Whenever an ecosystem is affected by a substantial disturbance event, individuals and even entire species may be weakened or killed off. Other ecological damage can also occur, such as changes in hydrologic processes or soil contamination. However, once the actual disturbance has occurred, ecological succession occurs. If the ecological disturbance has not greatly affected the abiotic factors of the area, a similar ecosystem to the one that existed prior to the disturbance may result.

In a number of regions around the world, human activities produce dramatic ecological disturbances. Deforestation or clear-cutting of tropical rain forests, the damming or polluting of rivers and streams, or the introduction of various chemicals and particulates into the atmosphere from industrial facilities have major effects on many ecosystems. Habitat destruction through deforestation dramatically reduces biodiversity and results in species extinction in some cases. Accumulation of harmful air pollutants, such as carbon dioxide (CO<sub>2</sub>), resulting from human activities is inducing global climate change. This human-produced pollution is causing disruptions in ecosystems due to the gradual warming of land and ocean temperatures, altered weather patterns (e.g., droughts, flooding), and sea level rise from melting glaciers and ice sheets. In cases where the ecological disturbance is ongoing, succession is stalled, and the damaged ecosystems may fail to recover.

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**Source Citation:**

"Disturbance, ecological." *The Gale Encyclopedia of Science*. Ed. K. Lee Lerner and Brenda Wilmoth Lerner. 4th ed. Detroit: Gale, 2009. *Gale Science In Context*. Web. 16 Nov. 2011.

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**Gale Document Number:** GALE|CV2644030696